

Installation, Start-Up and Service Instructions

CONTENTS

	Page
SAFETY CONSIDERATIONS	1
GENERAL	1
INSTALLATION	2-13
Step 1 — Select Location	2
Step 2 — Provide Air For Combustion and Ventilation	3
Step 3 — Assemble Furnace	3
• DRAFT HOOD	
Step 4 — Size Ductwork	4
Step 5 — Vent Furnace	4
• MASONRY CHIMNEY	
• TYPE B-1 VENT	
• ATTIC INSTALLATION	
Step 6 — Connect Gas Piping	5
• BURNER ORIFICES	
Step 7 — Make Electrical Connections	6
Step 8 — Install Filters	11
Step 9 — Reverse Components (if required)	11-13
START-UP AND ADJUSTMENT	13-15
SERVICE AND MAINTENANCE	15-17

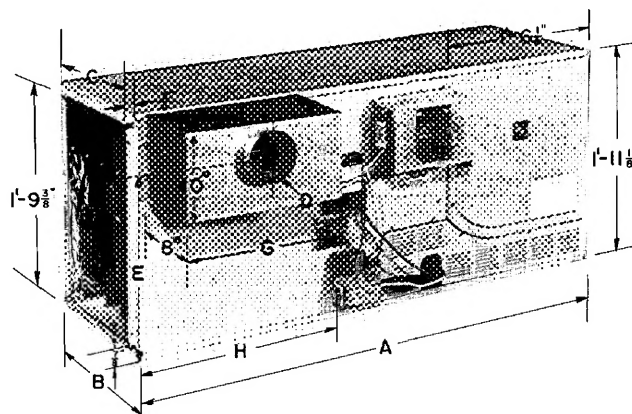


Fig. 1 — Furnace Dimensions (Model 58ED Shown)

junction box and a thermostat hookup as shown in the wiring diagram. The design of the furnace is such that the burners, controls and flue outlet can be assembled on the same side to facilitate servicing for installations where only limited access to the unit is available. (See Step 9 — Reverse Components.) The 58ED furnace (with intermittent electronic ignition) is shown in Fig. 1. This furnace has been designed to interface with split-system cooling equipment (approved by UL) to provide year-round air conditioning. The blower is sized for both heating and cooling. Table 1 provides physical data and dimensions of the furnaces, and Table 2 provides airflow data.

The furnace installation must conform with local building codes or, in the absence of local codes, with the National Fuel Gas Code, NFPA54-1984/ANSI Z223.1-1984. For complete information on installation standards consult the National Fuel Gas Code, obtainable at a nominal cost from the National Fire Protection Association, Inc., Batterymarch Park, Quincy MA 02269 or the

SAFETY CONSIDERATIONS

These instructions are intended for use by qualified personnel who have been trained in installing this type of furnace. Installation of this furnace by an unqualified person may lead to equipment damage and/or a hazardous condition which may lead to personal injury.

GENERAL

This furnace is designed for use with either natural or liquefied petroleum (propane) gases and has been design certified by the American Gas Association. It is shipped as a packaged unit, complete with burners and controls, and requires only a line voltage (115-v) connection to the

Table 1 — Physical Data and Dimensions

SIZE 58ED/PB FURNACE	050	075	100	125	140
INPUT (1000 Btuh)*	50	75	100	125	140
HEATING CAPACITY (1000 Btuh)†					
Non-Weatherized Indoor	38 39	56 58	75 77	94 96	105 108
TEMPERATURE RISE (F)	35-65	40-70	40-70	40-70	40-70
DIMENSIONS (ft-in.)					
Length A	4-6	4-6	4-6	4-8	4-8
Width B	1- 1½	1- 1½	1-5	1- 8½	2-0
Duct Opening C	0-11½	0-11½	1-3½	1- 6½	1-10½
Vent Diameter D	0-4	0-4	0-5	0-5	0-6
E	1- 8¾	1- 8¾	1-8¾	1- 8¾	1- 7¾
F	0- 8¾	0- 8¾	0-8¾	0- 9½	0- 9½
G	1-4	1-4	1-4	1- 5¼	1- 5¼
Gas Inlet H	1- 9¼	1- 9¼	1-9¼	1-11¼	1-11¼
	58ED 58PB	1- 7¾	1- 7¾	1- 5¼	1- 5¼
NUMBER OF BURNERS	2	3	4	5	6
SHIPPING WEIGHT (lb)	155	165	190	230	250

*Ratings shown are for elevations up to 2000 ft above sea level. For elevations above 2000 ft, deduct 4% of input capacity for each 1000 ft above sea level.

†Determined as per U.S. Government standard tests

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

American Gas Association, 1515 Wilson Boulevard,
Arlington, VA 22209.

⚠ WARNING

The furnace cabinet must have an uninterrupted or unbroken electrical ground to minimize personal injury if an electrical fault should occur. The unit must also be electrically grounded in accordance with local codes, with the National Electrical Codes ANSI/NFPA No. 70-1984 or the latest edition. Do not use gas piping as an electrical ground.

INSTALLATION

Step 1 — Select Location — This furnace may be located in an attic, basement crawl space, alcove or suspended from the ceiling of a utility room or basement. As shown in Table 3, the minimum clearances, or greater, must be provided between the furnace and adjacent construction.

⚠ WARNING

Failure to comply with all the recommended clearances will result in a fire hazard.

If a furnace is to be installed in a residential garage, it must be installed so the burners and the ignition source are located not less than 18 in. above the floor and the furnace must be located or protected to avoid physical damage by vehicles.

The furnace should be located as close to the chimney as possible in order to keep vent connections as short and direct as possible. The furnace should also be located as near to the center of the air distribution as possible, and should be mounted level.

Since this furnace is suitable for attic installation, it must *not* be installed directly on carpeting, tile or other combustible material. Line contact is only permissible between lines formed by the intersection of the furnace top and two sides and the building joists, studs or framing. See Fig. 2

A clearance of at least 30 in. should be provided at the front of the furnace for combustion air and servicing.

For attic installations, the passageway and service area adjacent to the furnace should have a floor installed. The areas adjacent to the combustion air openings must be covered with fireproof board or sheet metal extending a minimum of 12 in. from the furnace. See Fig. 2.

If the furnace is to be installed in a crawl space, consult local codes. Use of a concrete pad one to 2 in. thick is recommended.

If the furnace is to be suspended from the ceiling, it is necessary to use steel pipe straps around each end of the furnace. These straps should be attached to the furnace with sheet metal screws and bolted to the rafters. The furnace may also be suspended by an angle iron frame bolted to the rafters.

⚠ WARNING

Do not place combustible material on or against the draft hood.

⚠ WARNING

The furnace is not watertight and is not designated for outdoor installation.

Table 2 — Blower Data (Direct Drive)

FURNACE 58ED/PB	050						075						100						125						140																				
SERIES (15th Digit of Model No.)	A		B		C		A		B		C		A		B		C		C		D		B		C																				
BLOWER SIZE (In) DXW	10x4		10x4		10x6		10x6		10x6		10x6		10x8		10x8		10x8		12 x 9		12x9		12 x 12		12x12																				
MOTOR HP (PSC)	⅓		¼		⅓		⅓		¼		⅓		⅓		¼		⅓		½		¾		½		¾																				
SPEED TAP	Lo	Hi	Lo	Hi	Lo	Lo	Hi	Med	Hi	Med	Lo	Hi	Med	Hi	Med	Hi	Med	Hi	Med	Hi	Med	Hi	Med	Hi	Med																				
WIRE COLOR	Red	Blk	Red	Blk	Red	Red	Blk	Blu	Blk	Blu	Red	Blk	Blu	Blk	Blu	Blk	Blu	Blk	Blu	Blk	Blu	Blk	Blu	Blk	Blu																				
BLOWER RPM	830	1070	760	1080	700	920	1020	790	1060	820	860	990	730	1050	840	1070	820	1000	920	1070	970	1070	980	980	980																				
EXTERNAL STATIC PRESSURE (In wg)	20		50		20		50		20		50		20		50		20		50		20		50		20																				
AIRFLOW (Cfm)																																													
765		930		735		1220		790		1165		1130		995		1260		1090		1310		1290		1090		1530		1360		2010		1860		2115		1810		2100		1930		2350		2100	

⚠ WARNING

When operating furnace in heating mode, the static pressure and the temperature rise (outlet air temperature minus room temperature) must be within those limits specified on the AGA rating plate.

Table 3 — Alcove Clearances (in.)

TOP	SIDES	BACK	DRAFT HOOD	SINGLE WALL VENT
8	6	8* 18†	Line Contact	6

*With draft hood in front of furnace

†With draft hood on back of furnace

Step 2 — Provide Air For Combustion and Ventilation — For an unconfined space (more than 50 cu ft of volume per 1,000 Btu of aggregate input rating of all appliances installed in that space) such as a basement or attic, infiltration air is normally adequate to provide air for combustion, ventilation and dilution of flue gases. Adjoining rooms may be included if there are no doors between the rooms

For a confined space, where air is taken from an interior space, 2 permanent openings of equal area are required. One opening must be within 12 in. of the ceiling and the other must be within 12 in. of the floor. Each opening must have a free area of at least 1 sq in. per 1000 Btu of total input rating but not less than 100 sq inches.

If the outside air is supplied to a confined space, then the 2 openings must be equal and located as above and the free area of each must be:

1. One sq in. per 4,000 Btu of total input rating when the air is directly communicated from the outdoors.
2. One sq in. per 4,000 Btu of total input rating when the air is brought in through vertical ducts.
3. One sq in. per 2,000 Btu of total input rating when the air is transferred through horizontal ducts.

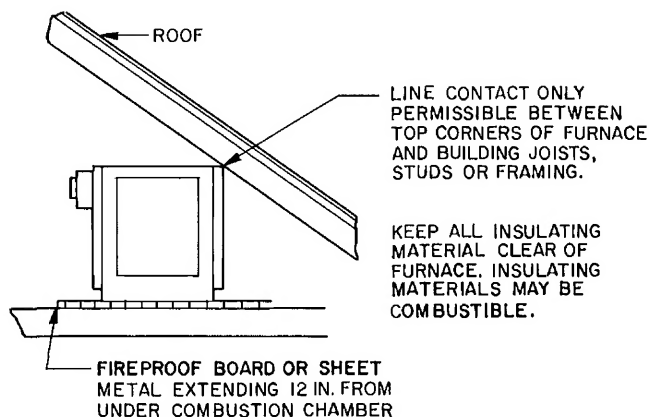


Fig. 2 — Attic Installation Showing Point Contact

⚠ CAUTION

Whenever this furnace is installed in an area along with one or more gas appliances, the total Btu input of all appliances must be included when determining the free area requirements for combustion and ventilation air openings.

When ducts are used, they must be of the same cross-sectional area as the free area of the openings to which they connect. The minimum dimension of rectangular air ducts must not be less than 3 inches.

The free area through a design of louver or grille should be used in calculating the size opening required to provide the free area specified. If the design and free area is not known, it may be assumed that wood louvers have 20-25% free area and metal louvers and grilles have 60-75% free area. Screens used must not be smaller than 1/4 in. mesh and louvers shall be fixed in the open position or interlocked with the equipment so that they are opened automatically during equipment operation.

⚠ WARNING

Do not block the combustion air openings in the furnace. Any blockage will result in improper combustion and may result in a fire hazard or unsafe condition

⚠ CAUTION

For an attic installation, keep insulation 12 in. or more away from any furnace openings. Some types of insulating materials may be combustible.

Step 3 — Assemble Furnace — The burner and controls are shipped in place and the furnace high- and low-voltage wiring is complete to facilitate the installation. Low-voltage wiring to the field-supplied thermostat is necessary to complete the unit wiring (see Step 7 — Make Electrical Connections).

In order to accommodate all the possible field installations that may exist, the unit is designed so that the gas valve, controls and draft hood assembly may be assembled on either side of the furnace. Refer to Component Reversal section for details. After reversal (if required), return to this section.

⚠ CAUTION

Remove cardboard shipping insert from eye of the blower scroll before energizing blower.

DRAFT HOOD — In order to save shipping space the draft hood is shipped disassembled (on models 125 and 140 the left panel is spotwelded in place). Remove the draft hood components from the blower compartment (on some models the panels might be packed outside the furnace jacket). On the models 50, 75 and 100 there will

be a wrapper, 2 panels (one marked with an "R", the other marked with an "L") and a hardware package.

Refer to Fig. 3 to assemble the draft hood. Depending on the model, one or both panels are slid into the proper location in order to line up the 4 mounting holes. Secure the panel(s) with the screws provided.

After completing the draft hood assembly, it is advisable to check the overall size with Table 4.

Install the draft hood over the selected flue opening by placing it on top of the draft hood clip and securing it to the furnace jacket with screws provided. Adhere to the necessary clearances as shown in Table 3.

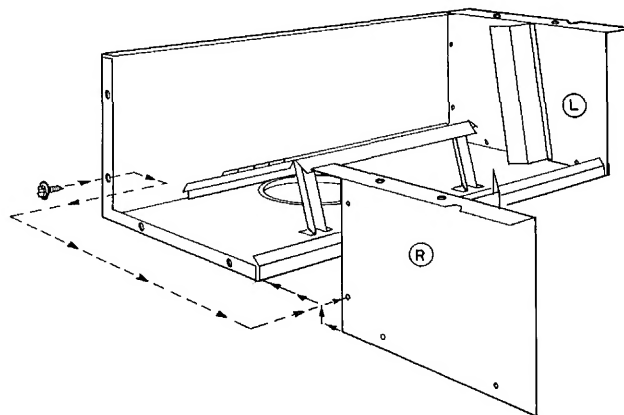


Fig. 3 — Draft Hood Assembly

Table 4 — Draft Hood Dimensions (in.)

FURNACE 58ED/PB	LENGTH	HEIGHT	DEPTH	PIPE DIA.
050	16	10	8	4
075	16	10	8	4
100	16	10	8	5
125	17¼	10	8	5
140	17¼	10	8	6

Step 4 — Size Ductwork — Proper ductwork sizing is necessary to ensure satisfactory heating operation. Ductwork should be in accordance with the latest editions of NFPA-90A (Air Conditioning Systems) and NFPA-90 B (Warm Air Heating and Air Conditioning Systems). Follow these recommendations when installing ductwork:

1. Install locking-type dampers in all branch or individual ducts to balance out system. Dampers should be adjusted to impose the proper static pressure at the outlet of the furnace.
2. Noncombustible flexible duct connectors are recommended to connect both the supply and return ducts to the furnace.
3. In cases where the return air grille is located close to the fan inlet, there should be at least one 90 degree air turn between fan and inlet grille. Further reduction in sound can be accomplished by installing acoustical air turning vanes and/or lining the inside of duct with acoustical material.

⚠ CAUTION

Air openings in burner cover, return air grilles, and warm air registers must not be obstructed.

⚠ WARNING

When supply ducts carry air circulated by the furnace to areas outside the spaces containing the furnace, return air shall also be handled by a duct sealed to the furnace casing and terminating outside the space containing the furnace.

When installing the furnace with cooling equipment for year-round operation, the following recommendations should be followed for series or parallel airflow:

1. In series airflow applications, the coil is mounted after the furnace in an enclosure in the supply air-stream. The furnace blower is used for both heating and cooling airflow.

⚠ WARNING

The coil *must* be installed on the air discharge side of the furnace. Under no circumstance should the airflow be such that cooled, conditioned air can pass over the furnace heat exchanger. This causes condensation in the heat exchanger and possibly early failure due to rust.

2. In parallel flow installation, dampers must be provided to direct air over the furnace heat exchanger when heat is desired and over the cooling coil when cooling is desired.

IMPORTANT: The dampers should be adequate to prevent cooled air from entering the furnace, and if manually operated, must be equipped with means to prevent operation of either the cooling unit or furnace unless the damper is in the full cool or heat position.

Step 5 — Vent Furnace — This furnace must be vented to the outside and in accordance with local codes or requirements of the local utility. In the absence of local codes, venting should conform to the requirements of the National Fuel Gas Code (NFPA 54-1984/ANSI Z223.1-1984 Part 7).

For additional venting information, refer to ANSI/NFPA 211 Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances.

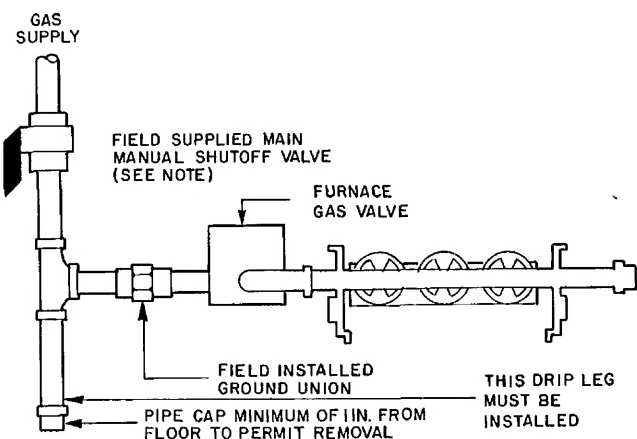
This furnace must not be vented into a solid fuel burning chimney. The chimney must be checked for deterioration. Correct the condition before venting the furnace into the chimney. The chimney must be properly lined and sized per National Fuel Gas Code (ANSI Z223.1-1984/NFPA-54, 1984).

MASONRY CHIMNEY — This furnace can be vented into an existing masonry chimney. Normal connections to a chimney are made using single wall pipe; however, single wall pipe is not approved to pass through any attic, inside wall or concealed space or through any floor. For further information, consult venting section of National Fuel Gas Code.

TYPE B-1 VENT — The furnace is also approved for use with a Type B-1 vent that terminates through the roof (horizontal venting through an outside wall is not approved). The vent must be terminated with a listed cap or roof assembly. This venting must be installed in accordance with the vent manufacturer's instructions and be in accordance with all local codes.

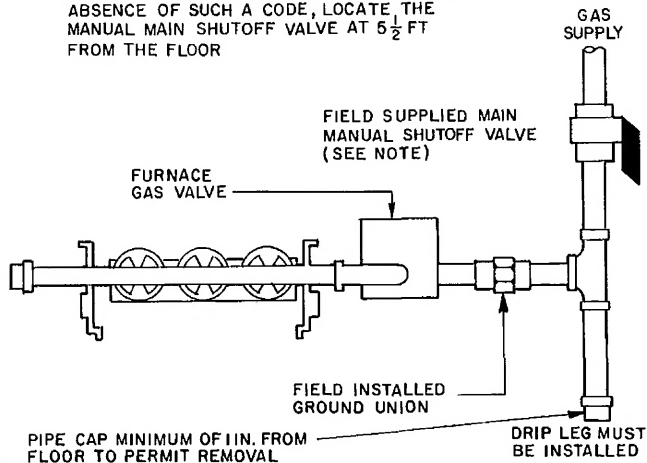
ATTIC INSTALLATION — Attic and/or National Fuel Gas installations require the use of Type B or Type L vent material. The following requirements are provided for venting system:

1. Ensure the chimney flue is clear of any dirt or debris.
2. Ensure the chimney is not serving an open fireplace.
3. Never reduce the pipe size below the outlet size of the furnace.



GAS PIPE LAYOUT FOR FURNACE AS SHIPPED

NOTE:
LOCATE MANUAL SHUTOFF VALVE AS REQUIRED BY THE LOCAL AUTHORITY OR CODE. IN THE ABSENCE OF SUCH A CODE, LOCATE THE MANUAL MAIN SHUTOFF VALVE AT 6 1/2 FT FROM THE FLOOR



GAS PIPE LAYOUT AFTER REVERSING COMPONENTS

Fig. 4 — Gas Pipe Layout

4. All pipe should be supported using the proper clamps and/or straps
5. All horizontal runs of pipe must have an upward slope of 1/4 in. per foot.
6. All runs of pipe should be as short as possible with as few turns as possible.
7. Seams must be tightly joined and checked for leaks.
8. The flue pipe must not extend into the chimney, but be flush with the inside chimney wall.
9. The chimney or gas vent must extend 3 ft above the highest point where it passes through a roof of a building and at least 2 ft higher than any portion of a building within a horizontal distance of 10 feet. It shall also extend at least 5 ft above the highest connected equipment flue collar.
10. Check local codes for any variance.

Step 6 — Connect Gas Piping — Install gas piping to provide a supply of gas sufficient to meet the maximum demand without undue loss of pressure between the gas meter and the furnace. The gas line to the furnace should be a separate line direct from the meter, unless the existing gas line is of ample capacity. Refer to Table 5 for sizing gas piping.

Use a joint compound (pipe dope) resistant to the action of liquefied petroleum gases or to any other chemical constituents of the gases to be conducted through the piping.

Before any system of gas piping is finally put into service, it should be carefully tested to determine if it is gas tight. The piping must withstand a pressure of 6 in. Hg for a period of 10 minutes or as required by local authority.

⚠ WARNING

The furnace and its individual shutoff valve must be *disconnected* from the gas supply system during any pressure testing of that system at test pressures in excess of 1/2 psig. The furnace must be *isolated* from the gas supply piping system at pressures equal to or less than 1/2 psig.

The recommended method for installing the gas piping to the furnace is shown in Fig. 4. Also shown is correct piping if the gas valve and controls have been reversed in the field.

Table 5 — Gas Pipe Sizing (Cu Ft of Gas per Hour)*

LENGTH OF PIPE (ft)	DIAMETER OF PIPE — IPS (in.)				
	1/2	3/4	1	1 1/4	1 1/2
10	132	278	520	1050	1600
20	92	190	350	730	1100
30	73	152	285	590	890
40	63	130	245	500	760
50	—	115	215	440	670
75	—	93	175	360	545
100	—	79	150	305	460
150	—	64	120	250	380

*Based on gas pressures of 0.5 psig or less and pressure drop of 0.3 in. wg and 0.60 specific gravity gas

Support all gas piping independent of the furnace. For propane gas, a tank regulator is required to reduce supply pressure to 12-13 in. wg. For manifold pressure, see Table 6.

Check all piping for leaks using soapy water and a brush.

⚠ CAUTION

Never use an open flame when testing for gas leaks!
Use a soap and water solution

A 1/8 in. NPT plugged tap accessible for test gage connection must be installed immediately upstream of the gas supply connection to the furnace if one is not supplied on gas valve.

BURNER ORIFICES — The furnace is supplied with standard orifices for the gas shown on the rating plate. Table 6 shows combinations of heating values and specific gravities for various fuels, from which proper input may be obtained

Regardless of the type of gas used, when installation is at an elevation of 2000 ft or more above sea level, orifices may need to be changed, depending on local gas value. For operation at elevations above 2000 ft, input ratings should be reduced at the rates of 4% for each 1000 ft above sea level. To change orifices, remove the burner removal cover on the gas valve side of unit. Remove manifold locking device and slide the manifold tray back until each burner is clear of heat exchanger tube. See Fig. 5 Pull the manifold tray forward until burners are clear of furnace. Remove the locking device from each burner and pull each burner back off the orifice.

⚠ CAUTION

Take care when removing the pilot burner not to damage the pilot gas line.

After removing orifices, ensure the new orifices are seated properly and tightened. Replace burners correctly and secure with the locking device before replacing and securing the manifold assembly.

⚠ CAUTION

The manifold must be properly positioned in order to engage the locking mechanism

Table 6 — Burner Orifices

TYPE OF GAS (Heating Value — SP GR) BTU PER CU FT	ORIFICE SIZE (Drill No.)
NATURAL — MANIFOLD PRESS. 3.5 in. wg	
800 — 0.6	43
900 — 0.6	44
1000 — 0.6	45
1100 — 0.6	46
PROPANE — MANIFOLD PRESS. 10 in. wg	
2500 — 1.53	54

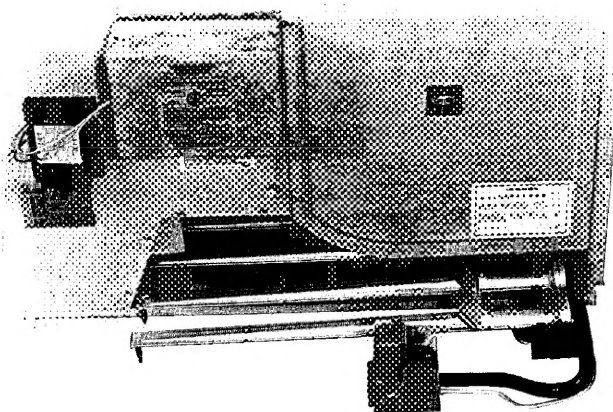


Fig. 5 — Burners Removed From Furnace

After securing the manifold assembly, replace all other components and/or wiring, being sure that all connections and screws are tightened.

⚠ WARNING

If it is necessary to adjust the manifold pressure more than 0.3 in. wg, the orifices must be changed

⚠ WARNING

Never set the furnace input rate above that shown on rating plate.

Use the following formula to determine the furnace input rate:

Input (Btuh) = Heating Value of Gas (Btu/cu ft)

$$\frac{\times 7200 \text{ sec}/2 \text{ hr}}{\text{Time in sec for 2 cu ft of gas}}$$

Example. If the heating value of natural gas is 1015 Btu/cu ft and it takes 75 seconds to burn 2 cu ft of gas, then:

$$\text{Input (Btuh)} = \frac{1015 \text{ Btu/cu ft} \times 7200 \text{ sec}/2 \text{ hr}}{75 \text{ sec}/2 \text{ cu ft}}$$

Input = 97,440 Btuh

When checking rate, make sure all other gas appliances are shut off except for pilot burners.

Step 7 — Make Electrical Connections — The control system depends on the correct polarity of the power supply. Connect field power wiring and field ground wire as shown in Fig. 6 and 7.

⚠ WARNING

The unit cabinet must have a separate uninterrupted or unbroken electrical ground to minimize personal injury if an electrical fault should occur.

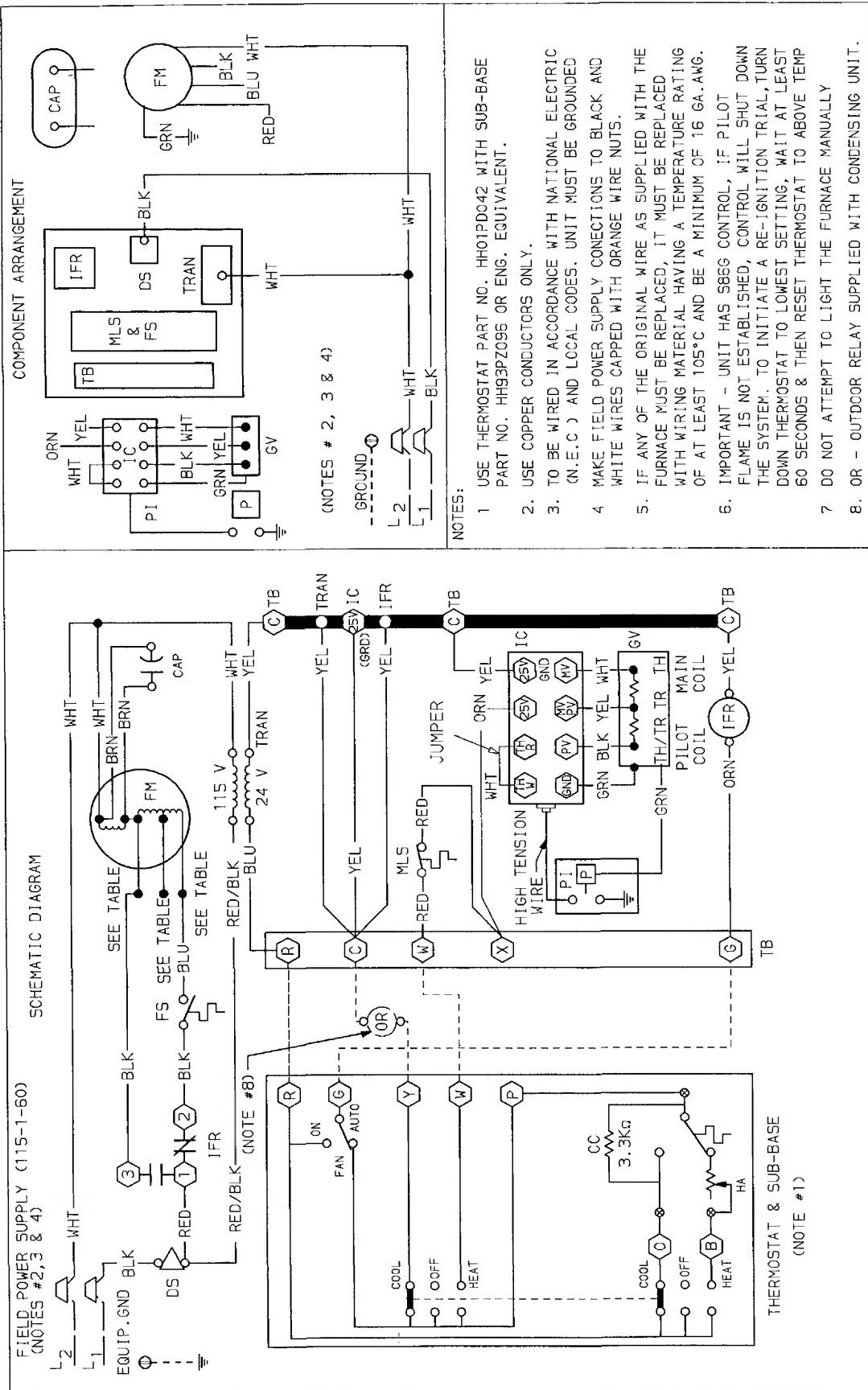


Fig. 6 — 58ED Furnace Wiring Label — Heat/Cool

LEGEND (FIG. 6 and 7)

- | | | | |
|------|---------------------|-----|-------------------|
| Cap. | Capacitor | IFR | Indoor Fan Relay |
| CC | Cooling Compensator | LS | Limit Switch |
| DS | Door Switch | MLS | Main Limit Switch |
| IC | Ignition Control | OR | Outdoor Relay |
| FM | Fan Motor | P | Pilot |
| FS | Fan Switch | PI | Pilot Igniter |
| GV | Automatic Gas Valve | SI | Spark Igniter |
| HA | Heat Anticipator | TB | Terminal Board |

- | | | | |
|----------------------|-------------|--------------------------------------|--|
| Tran | Transformer | Common Potential (Not Actual Wiring) | |
| Field Power Wiring | | Field Ground Wiring | |
| Field Control Wiring | | | |

- | | |
|---------------------------------|--|
| Component Connection (Unmarked) | |
| Component Connection (Marked) | |
| Field Splice | |
| Junction | |
| Junction Thermostat to Subbase | |

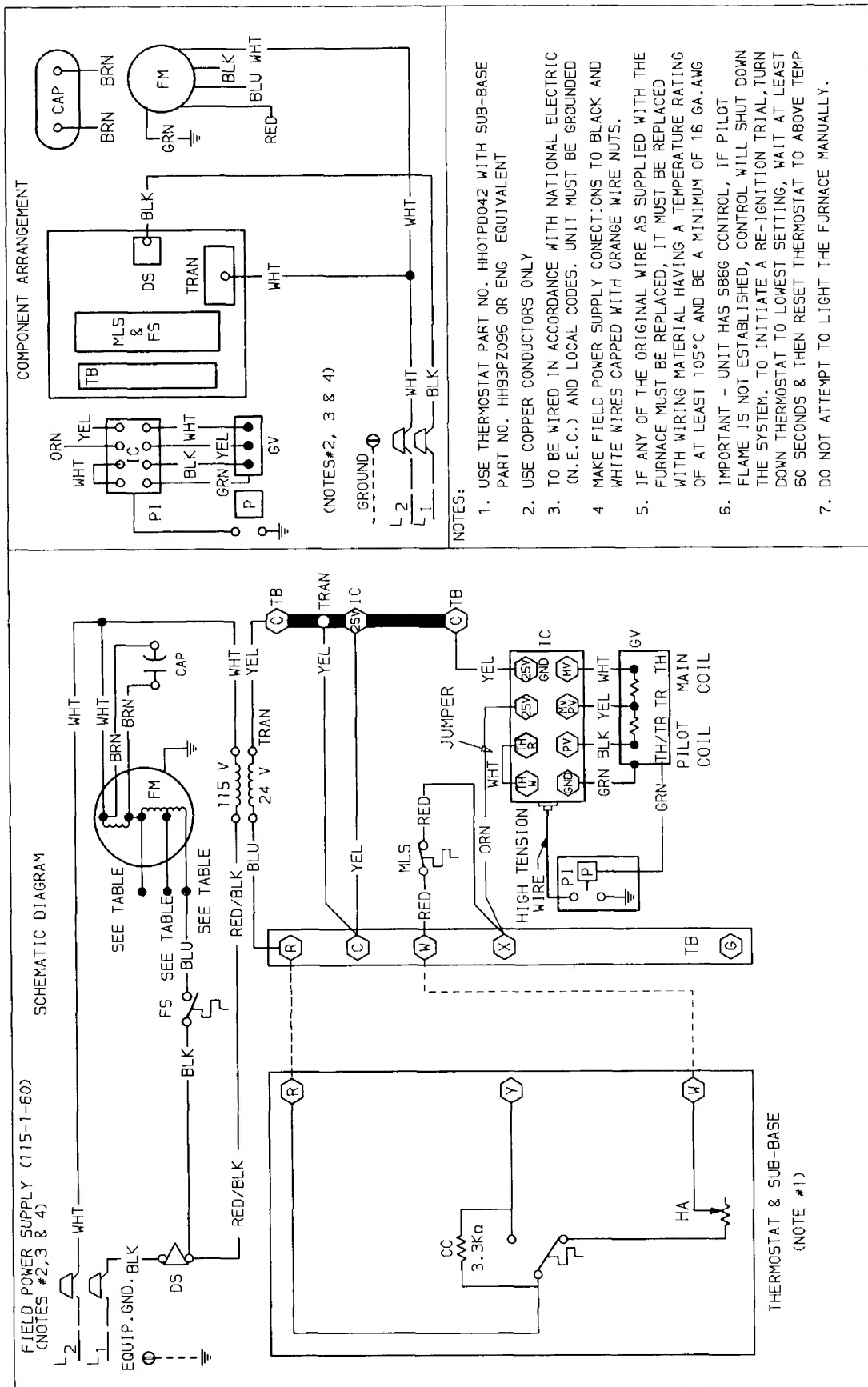


Fig. 6 (Cont) — 58ED Furnace Wiring Label — Heat Only

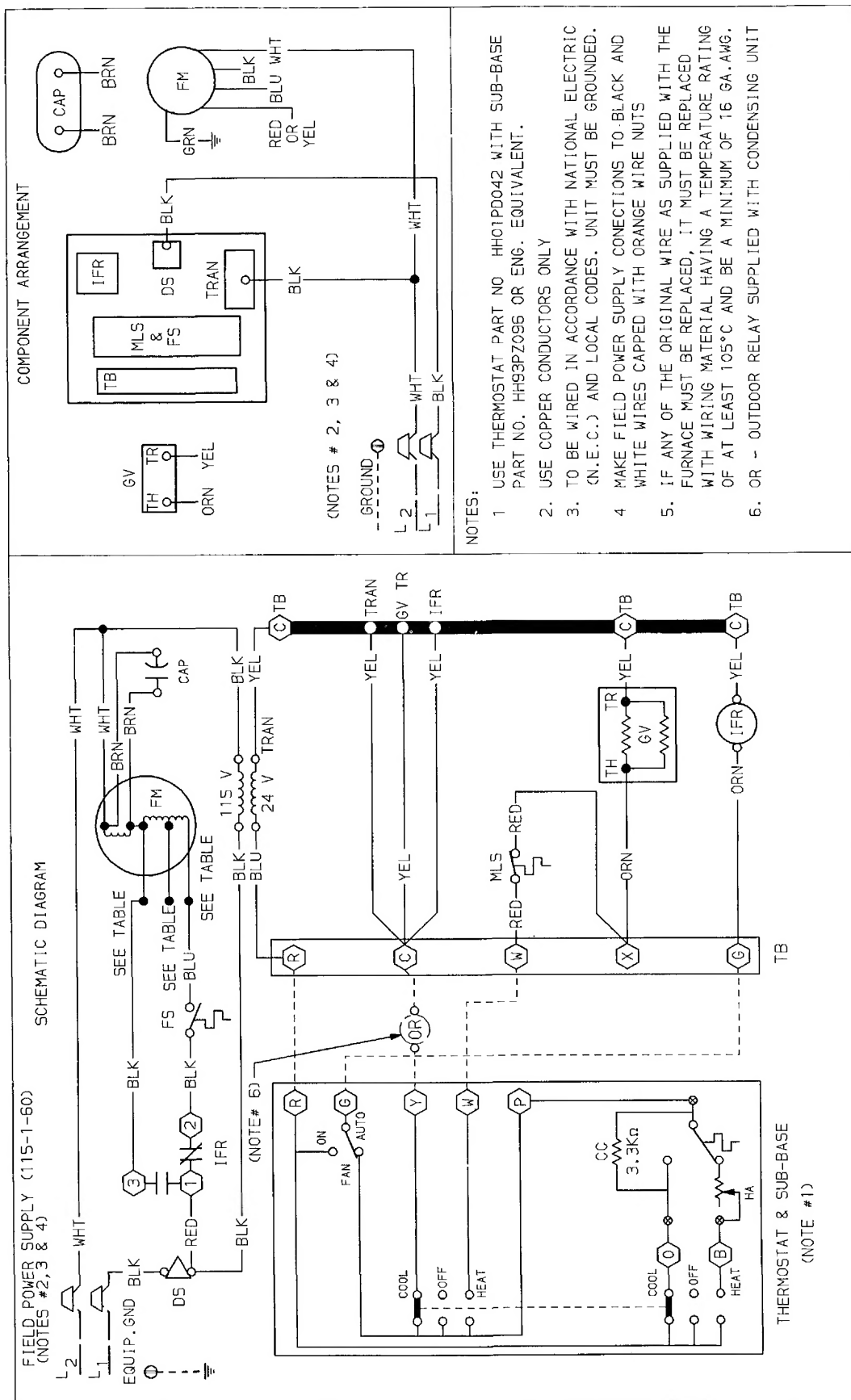


Fig. 7 — 58PB Furnace Wiring Label — Heat/Cool

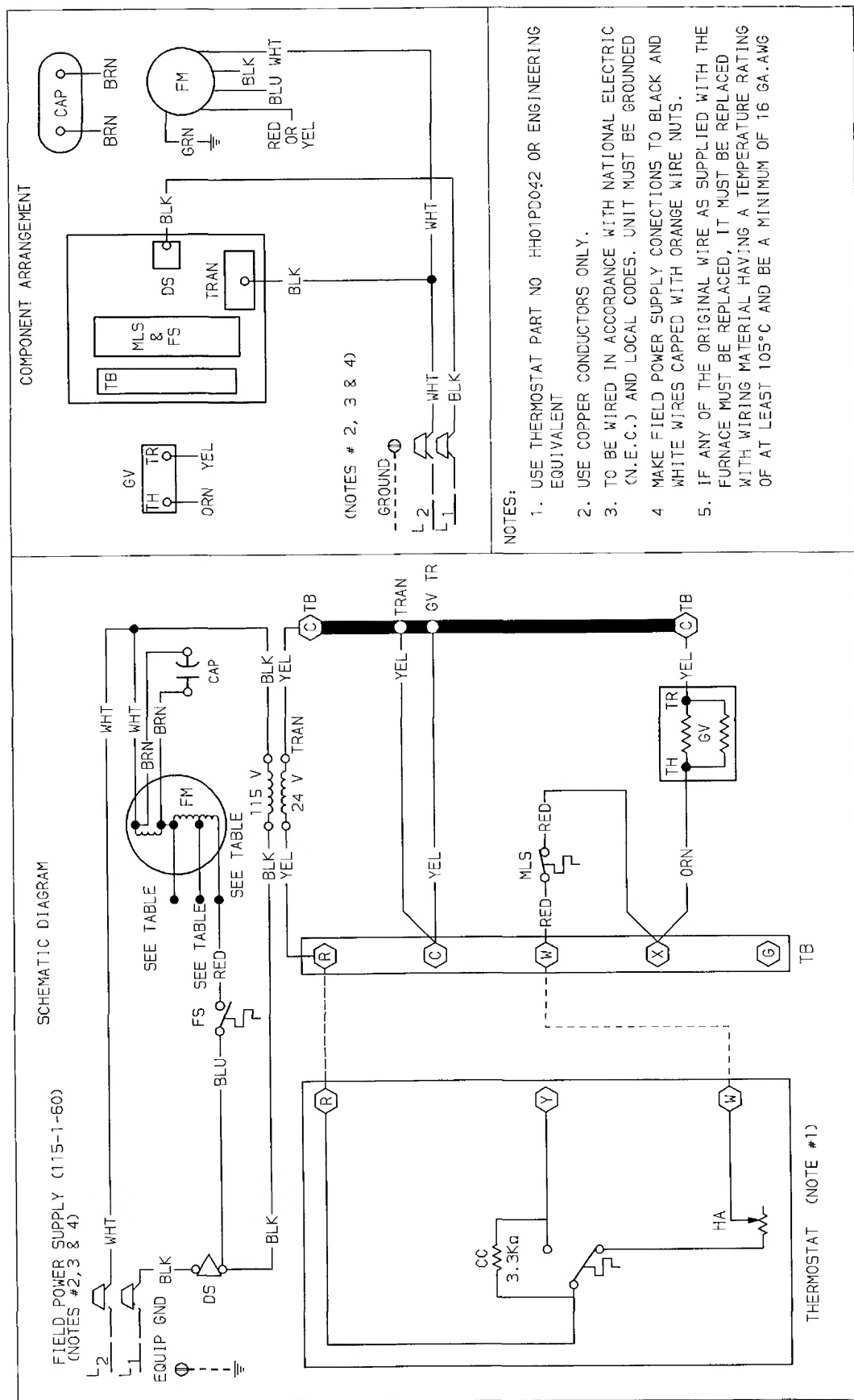


Fig. 7 (Cont) — 58PB Furnace Wiring Label — Heat Only

Use only copper wire for 115 v supply service to furnace. When replacing any original wiring, use only 105 C, 16 gage AWG copper wire.

Instructions for wiring the thermostat are packaged with the thermostat (field supplied). Make connections as shown in wiring labels at the 24 v terminal board located on the electrical junction box. When installing accessories to this furnace, follow manufacturer's instructions included with the accessory. Except for thermostat wiring, a minimum of type T (63F rise) must be used.

Step 8 — Install Filters — Filters and racks are available as accessories. See Fig. 8 for recommended filter size rating and type.

IMPORTANT: All furnaces must be equipped with a filter.

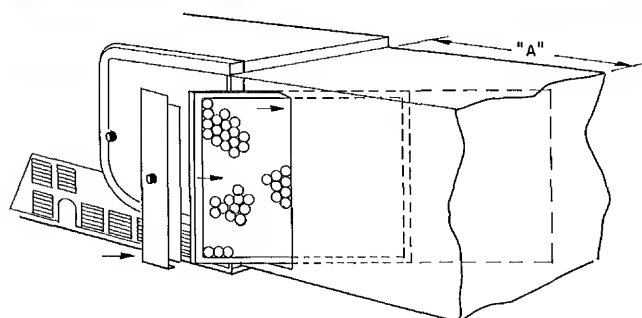
Step 9 — Reverse Components (if required).

⚠ WARNING

Before proceeding with component reversal, make sure that all power is turned off upstream of furnace and all gas piping is shut off and disconnected from furnace.

⚠ CAUTION

Before proceeding with field reversing, ensure a correct wiring diagram is available and/or be prepared to mark all wiring as it is disconnected.



INPUT (1000 BTUH)	A (IN)
50	14 1/2
75	14 1/2
100	16 3/4
125	20 1/4
140	15 3/8

NOTE:
FILTER RACK TO INLET
END OF FURNACE INSTALLED
INTO RETURN DUCTWORK.

Fig. 8 — Accessory Filter Rack Assembly

All references to left or right side of furnace refer to the furnace looking at the heat exchanger (supply air side).

The gas valve, pilot burner components and controls may be reversed as follows:

1. Loosen burner removal cover screws and remove both covers
2. Disconnect all wires to gas valve and unplug the igniter cable from the ignition control (if so equipped).
3. Remove the manifold locking device and slide the burner and manifold assembly back towards the furnace inlet until the burners are clear of the heat exchanger tubes. See Fig. 5.
4. Slide manifold assembly towards the front of furnace until it clears the blower deck.
NOTE: Keep manifold assembly straight while removing. If manifold is cocked, then the assembly will bind in burner box.
5. Place manifold on a work area and disconnect the pilot tubing and thermocouple, if equipped, from the valve
6. Using 2 pipe wrenches (one on the gas valve and one on the manifold extension pipe), remove the gas valve
7. Remove the manifold extension pipe from the manifold (it may be necessary to put a pipe wrench on the manifold pipe while turning the extension).
8. Using 2 pipe wrenches (one on the manifold pipe between the pipe cap and burner orifices and one on the pipe cap), remove the pipe cap.
9. Clean the threads on manifold pipes, gas valve and pipe cap of any old pipe dope.
NOTE: Use a joint compound (pipe dope) resistant to the action of liquefied petroleum gases or to any other chemical constituents of the gases to be conducted through the piping.
10. Using a suitable joint compound and 2 pipe wrenches, replace the manifold pipe extension where the pipe cap was. The pipe extension should be tightened and positioned so that it is pointing towards the back of the burners.
11. Using 2 pipe wrenches (one on the manifold extension and the other on the gas valve), tighten gas valve to the extension and position the valve so that the manual knob is in the 12 o'clock position
12. Using 2 pipe wrenches (one on the pipe cap and the other on the manifold pipe), tighten the pipe cap to the other end of the manifold pipe
13. Remove the screws holding the pilot bracket to the crossovers of the first 2 burners. When removing pilot assembly, be careful not to damage the pilot gas tubing and ignition cable (or thermocouple, if so equipped).

NOTE This step is not required for 050 size, as there are only 2 burners

14. With the pilot bracket removed from burners, rebend the pilot tubing and thermocouple at the second bend per Fig. 10. Make sure there are no kinks in tubing.
15. Connect the 1/4 in. diameter pilot gas tubing (and the thermocouple, if equipped on standing pilot models) to the gas valve. Be careful not to kink the aluminum tubing.
16. Check the pilot position as shown in Fig. 9 and 10.
17. *Standing pilot models only:* Mount the pilot bracket on the crossovers of the first 2 burners on the side of manifold where valve is now mounted (Fig. 10). Connect thermocouple and the 1/4 in. diameter pilot gas tubing to gas valve. This requires adjustments to pilot tubing and thermocouple. It is extremely important not to kink either the thermocouple or aluminum tubing.
18. Insert the manifold tray back into the furnace and slide the burners into the heat exchanger tubes. The locking device will not engage unless the manifold is in the correct position.
19. Lock the manifold in place (on electronic ignition models, be sure the ignition cable or sensing lead is not pinched under the burners).
20. Remove the junction box cover and disconnect the motor leads.
21. Remove junction box. See Fig. 11. *On standing pilot models,* remove 2 hole plugs from back side of furnace and then remove junction box.

IMPORTANT: Pull junction box straight out from furnace until fan and limit is clear of side panel.

22. Mount the junction box on the opposite side of furnace. Ensure door switch is kept towards the blower door when mounting junction box

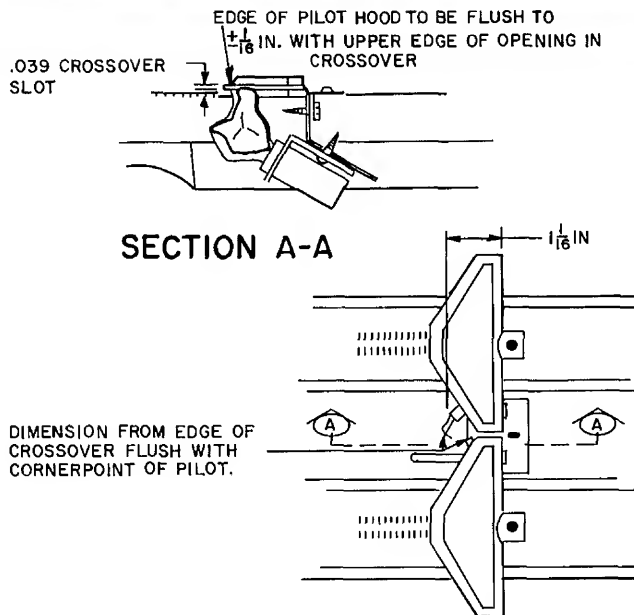


Fig. 9 — Pilot Location (in.)

NOTE: The fan and limit dial will be upside down when junction box is properly reversed. This does not affect the operation of fan and limit.

23. Remove the strain relief holding the motor wires, route motor leads under blower, feed wires into back of junction box and snap the strain relief into place.
24. Reconnect motor leads and replace junction box cover.
25. Replace hole plugs in openings where fan and limit and motor leads were
26. Remove the draft hood and draft hood support clip

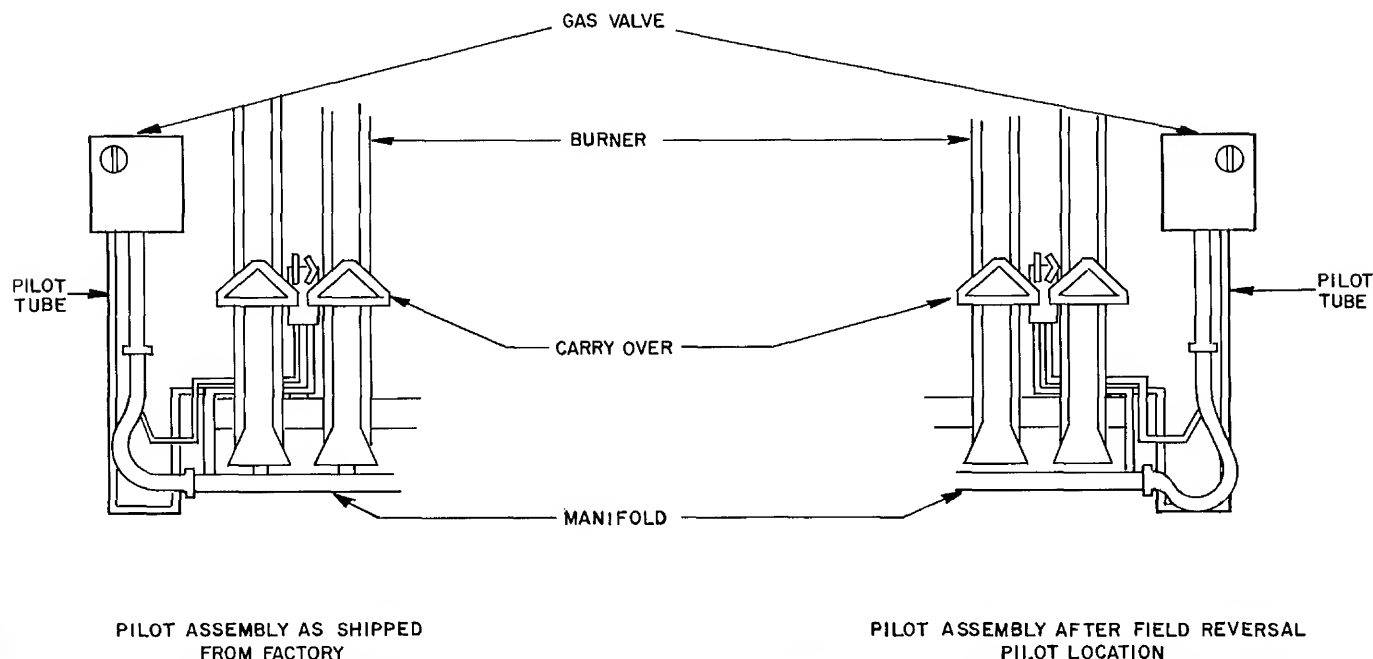


Fig. 10 — Pilot Assembly

27. Remove the flue box cover and flue box cover gasket and remount them where the draft hood was located. See Fig. 12. *Do not* glue gasket to cover plate.
28. Replace the draft hood support clip and the draft hood where the flue box cover plate was located.
NOTE: All controls, wiring, draft hood and the AGA lighting instruction plates must be located on the same side of the furnace as the automatic main gas valve. Reattach all wires to gas valve and check against wiring diagram.
29. *Electronic ignition models only:* Reattach all wires to the gas valve and the ignition cable to the ignition control.
Check all wiring against the wiring diagram, Fig. 6 and 7.
30. After the furnace components have been reversed, return to Step 3, Assemble Furnace Draft Hood and proceed with remainder of installation.

START-UP AND ADJUSTMENT

Standing Pilot Models

OPERATIONAL CHECKOUT — The automatic gas valve controls the flow of gas to both the pilot and main burners. The manual valve built into the automatic valve body has 3 positions: OFF, PILOT, and ON.

SEQUENCE OF OPERATION — The furnace operates automatically. It is controlled by a thermostat which is set at the desired temperature. When indoor temperature drops below this setting, the thermostat turns on the system.

When the thermostat calls for heat, power from the transformer energizes the main gas valve (the pilot must be lit already) and gas flows through the valve to the burners. The pilot flame lights the burners.

A heat sensing switch automatically energizes the blower when heat buildup is sufficient. The air is moved by the blower over the heating element, thus warming it, and it goes through the ducts to room registers.

When the thermostat is satisfied, the circuit is broken, de-energizing the main gas valve and stopping gas flow to the main burners.

The blower continues to run until the heat in the heat exchanger is removed and then the sensing switch shuts off the blower.

All forced air furnaces are equipped with a high temperature limit switch which prevents the furnace from overheating. If the furnace overheats for any reason, the high temperature limit opens, breaking the circuit to the gas valve. The blower motor continues to run. The main burners cycle on limit until the fault is corrected.

⚠ WARNING

If overheating occurs, or if the gas supply fails to shut off, shut off the manual gas valve to the furnace before shutting off the electrical supply.

Electronic Ignition Models

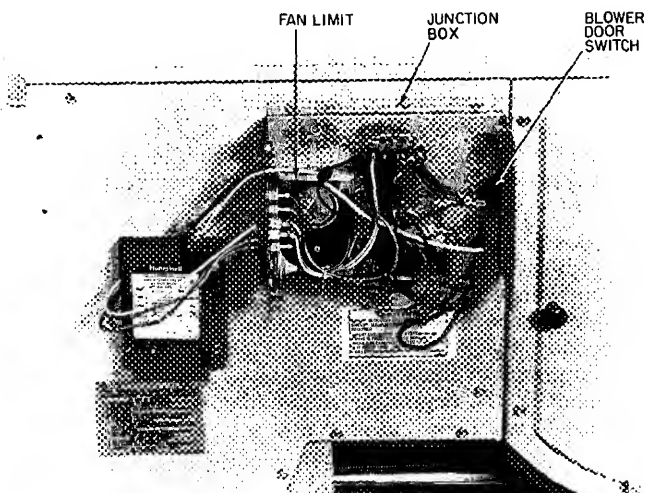
OPERATIONAL CHECKOUT — The automatic gas valve controls the flow of gas to both the pilot and main burners. The manual valve built into the automatic valve body has 2 positions: OFF and ON.

SEQUENCE OF OPERATION — The furnace operates automatically. It is controlled by a thermostat which is set at the desired temperature. When indoor temperature drops below this setting, the thermostat turns on the system.

When the thermostat calls for heat, power from the transformer simultaneously energizes the pilot gas valve (inside the main gas valve) and the spark igniter. After the pilot flame is established, the electrode ceases to spark and the flame sensing probe acts to energize the main gas valve, permitting gas flow to the burners.

A heat sensing switch automatically energizes the blower when heat buildup is sufficient. The air is moved by the blower over the heating element, thus warming it, and it goes through the ducts to room registers.

When the thermostat is satisfied, the circuit is broken, de-energizing the main gas valve and stopping gas flow to the pilot and main burners. The blower continues to run until the heat in the heat exchanger is removed and then the sensing switch shuts off the blower.



**Fig. 11 — Junction Box
(Model 58ED Shown)**

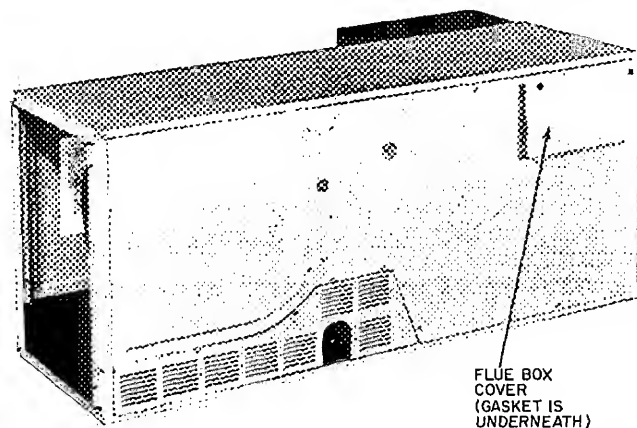


Fig. 12 — Flue Box Cover

All forced air furnaces are equipped with a high temperature limit switch which prevents the furnace from overheating. If the furnace overheats for any reason, the high temperature limit opens, breaking the circuit to the gas valve. The blower motor continues to run. The main burners cycle on limit until the fault is corrected.

⚠ WARNING

If overheating occurs, or if the gas supply fails to shut off, shut off the manual gas valve to the furnace before shutting off the electrical supply.

The furnace is equipped with either Honeywell S86E or S86G intermittent pilot control.

S86E control. If the pilot fails to light, the pilot valve and spark gap remain energized until there is a successful ignition.

S86G control: If the pilot fails to light, the control will shut down the system. To initiate a reignition trial, turn down the thermostat to lowest setting, wait at least 60 seconds, and then reset thermostat to a setting above room temperature.

Starting Procedure

STANDING PILOT MODELS

1. Set the manual gas shutoff valve at OFF position. Wait 5 minutes.
2. Be sure all electrical power to furnace is off.
3. Check all wiring using proper wiring diagram on inside of blower door.
4. Light the pilot by following instructions on lighting plate. (Main burners should not light.)
 - a) Remove burner cover.
 - b) Turn manual gas shutoff valve to PILOT position.
 - c) Depress dial, light pilot with a match or taper. Keep dial depressed until pilot remains lit after dial is released (approximately 30 - 45 seconds). If pilot does not remain lit, repeat operation, allowing a longer period before releasing dial.
 - d) Replace burner cover.
5. Adjust pilot flame to envelop the thermocouple a distance of $\frac{3}{8}$ to $\frac{1}{2}$ inch. The adjusting screw for pilot flame is located on main gas control. With standing pilot, rate is approximately 1000 Btuh. See Fig. 13.

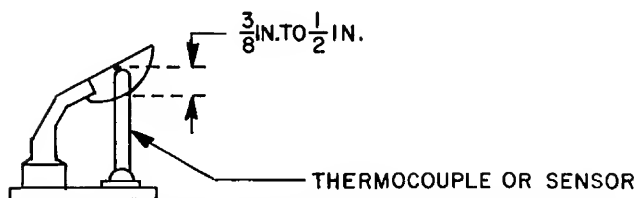


Fig. 13 — Pilot Thermocouple or Sensor Position

6. With the pilot lit, set thermostat above room temperature.
7. Turn on power supply to furnace. This energizes gas valve which should click open. The burners should *not* light.

8. Open the manual gas valve on the automatic gas valve. Burners should light and remain on.
9. Check for leaks in manual valve, gas control valve and gas connections using soap and water solution.

⚠ CAUTION

Never use an open flame when testing for leaks. Use soap and water solution.

10. Leave burners on for 15 minutes before making combustion adjustment

ELECTRONIC IGNITION MODELS

1. Set the manual gas shutoff valve at OFF position. Wait 5 minutes.
2. Be sure all electrical power to furnace is off
3. Check all wiring using proper wiring diagram on inside of blower door.
4. Set thermostat above room temperature.
5. Turn on power supply to furnace. This energizes the pilot valve and spark igniter. The burners should *not* light.
6. Turn dial on gas valve to ON position. The pilot should light. When the sensing probe detects the presence of pilot flame, the control de-energizes spark igniter and energizes main gas valve. Main burners should light and remain on. (If system shuts down on S86G control, a reignition trial is necessary.)
7. Check for leaks in manual valve, gas control valve and gas connections using a soap and water solution.

⚠ CAUTION

Never use an open flame when testing for gas leaks. Use a soap and water solution.

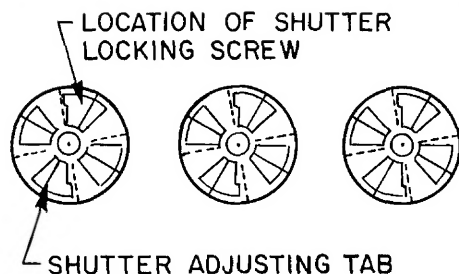
8. Leave burners on for 15 minutes before making a combustion adjustment.

Combustion Adjustment

ALL FURNACES — A primary air shutter assembly is provided on all furnaces. The shutters are factory set for natural gas furnaces and a closed position for LP gas furnaces. Readjustment may be required to obtain optimum setting. Shutters are individual to each burner, so adjustment of the burner flame must be done one burner at a time. See Fig. 14.

Loosen the locking screw and close the air shutter. This should cause the burner flame to glow bright yellow. Open the shutter until the flame turns blue. Lock the locking screw. See Fig. 15 for proper flame. Repeat this procedure until all burners are properly adjusted. A visual check of the main burner and pilot flame should be made at the beginning of each heating season.

Safety Pilot Check — *For Standing Pilot Models Only.* After operating for 15 minutes, turn the valve to the OFF position. The pilot switch should snap open between 20 seconds and 3 minutes later. To re-ignite pilot, follow the nameplate instructions.



NOTE: LOOSEN LOCKING SCREW BEFORE ADJUSTING SHUTTER. RETIGHTEN SCREW AFTER FINAL ADJUSTMENTS ARE MADE.

Fig. 14 — Air Shutter Adjustment

Manifold Pressure Adjustment — For natural gas, best results are obtained with a manifold pressure of 3.0 in. to 3.5 in. wg. Remove pressure tap pipe plug from the gas valve and connect to a water manometer. Measure gas pressure with the furnace on.

Turn regulator adjusting screw in to increase pressure, or out to decrease pressure.

For LP gases, a 10 in. wg pressure is required. Input rate must be maintained at $\pm 2\%$.

Fan Adjustment Check — This furnace is equipped with a 3-speed direct drive motor to deliver a temperature rise within the range specified on the rating plate, between the return and supply plenums at the external duct static pressure noted on the AGA rating plate. Consult the wiring diagram for speed changes on the direct drive motor. Adjust fan speed so that temperature rise is within rating plate specifications.

Fan and Limit Control Check — After the furnace has been operating for at least 15 minutes, restrict the return air supply by blocking the filters or closing the return air registers and allow the furnace to shut down on high limit. *The fan must continue to run.* Remove the restriction and the burner should come on in a few minutes.

The operational checkout is now complete. Be sure to adjust the thermostat to the desired setting and inform the owner how to operate the furnace system before leaving the jobsite.

Stopping the Furnace — Follow these procedures to shut down the furnace for the summer, if required.

1. Disconnect electrical power to all accessories.
2. To shut down main burner, turn gas cock dial clockwise to OFF position
3. (Standing pilot models only): To shut down both pilot and main burner, depress dial and turn clockwise to OFF position
4. Turn off all electrical power to furnace.
5. Turn off water supply to humidifier, if so equipped.

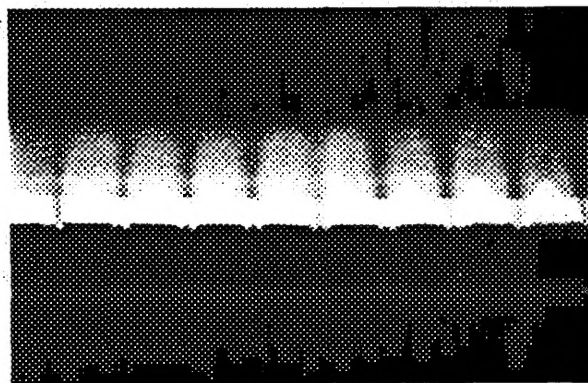


Fig. 15 — Burner Flames

SERVICE AND MAINTENANCE

⚠ CAUTION

The ability to properly perform maintenance on this equipment requires certain mechanical skills and tools. If you are at all uncertain, contact your Carrier dealer for qualified maintenance and service.

⚠ WARNING

Turn off all gas and electrical power to furnace before performing any maintenance or service on unit. Failure to take this precaution may result in personal injury due to electrical shock or uncontrolled gas leakage.

NOTE: Furnace is equipped with a blower door switch which cuts electric power when blower door is removed.

Air Filter — In order to acquaint the user of the furnace with proper procedure for inspecting and cleaning the filter, the installer should instruct the user to locate, remove, clean and replace the furnace filter(s).

NOTE: If furnace is equipped with accessory filter rack, refer to section on page 11.

⚠ CAUTION

Personal injury or property damage may result if furnace is operated with the blower compartment door removed. A lack of adequate combustion air may cause the main burner flame to be drawn out of the furnace unless blower compartment door is secured.

After inspecting or replacing the filter, be sure that the blower compartment door is securely fastened in place. Never operate the furnace without a filter.

Lubricating Motors — Direct drive motor and blower assemblies are factory lubricated and normally do not require oiling.

Cleaning Heat Exchanger and Venting System

— The heat exchanger and venting system should be checked each year by a qualified dealer. If necessary, the following procedures should be performed:

1. Make sure that all utilities are turned off upstream of the furnace (both gas and electrical supplies).
2. Remove burner covers, manifold assembly with burners, vent connectors and draft hood.
3. Clean flue box, flue ways, burner box and burners with brush and/or vacuum cleaner.
4. After cleaning, check pilot for proper position. Replace all parts.

5. Turn on gas and electrical supplies. Test for leaks using soap and water solution.

⚠ CAUTION

Never use an open flame when testing for gas leaks. Use a soap and water solution.

6. Check for proper operation of all controls.

Table 7 — Trouble Analysis Chart for Standing Pilot Models

⚠ WARNING

Turn off gas and electrical supplies to furnace before servicing. (Unless specific test requires gas and electrical supplies)

SYMPTOM AND PROBABLE CAUSE	REMEDY
BURNERS WILL NOT IGNITE	
1 Pilot light out	1 Relight pilot. If pilot does not remain lit, replace thermocouple.
2 No 115-v power to furnace	2. Connect to power supply. Check fuse, wiring or circuit breaker.
3 No 24-v power to control circuit	3. Check transformer; replace.
4. Miswired or loose connections	4 Check all wiring and wirenut connections.
5. No gas at main burners	5 Check to see if main valve is operating. Look for loose or broken wiring connections. If no deficiency is found, replace valve assembly.
6 Flame probe or connecting lead is shorted or open	6. Correct electrical shorting or open circuit.
INADEQUATE HEATING	
1 Furnace undersized for application	1 Replace with proper size furnace.
2 Gas input to furnace too low	2. Check gas pressure at manifold. Clock gas meter for input. If too low, increase manifold pressure, or replace with correct orifices.
3 Limit switch cycles main burners	3 OFF setting of fan control set too high; reset. Dirty air filters; clean and reinstall. Blower speed too low; use faster speed tap. Registers closed, restricted ductwork, open or remove restriction. Check heat anticipator setting on thermostat, readjust.
ALDEHYDE ODORS (CO), SOOTING FLAME, FLOATING FLAME	
1 Incomplete combustion — poor flame characteristics	1 Air shutter on burners closed, adjust to soft, blue flame. Check all screws around flue outlets and burner compartment, tighten. Lack of combustion air, see Installation section. Cracked heat exchanger; replace. Overfired furnace; reduce input or change orifices. Check vent for restriction; clean as required.

Table 8 — Trouble Analysis Chart for Electronic Ignition Models

⚠ WARNING

Turn off gas and electrical supplies to furnace before servicing (Unless specific test requires gas and electrical supplies.)

SYMPTOM AND PROBABLE CAUSE	REMEDY
PILOT WILL NOT LIGHT	
1 No spark at electrode	<p>1 Check spark gap, refer to Start-Up and Adjustment section</p> <p>Check if induced draft motor is operating. If not, check power to motor</p> <p>Check for any blockage in flue venting system and chimney, thereby preventing pressure switch from closing. Unblock if necessary</p> <p>Check moisture or dirt accumulation on electrode ceramic, clean ceramic with cloth</p> <p>Cracked ceramic, replace pilot electrode assembly</p> <p>Check for loose or broken wiring at and between electronic control box and electrode. Replace wire as necessary</p> <p>Check fuse or circuit breaker for 115-v supply to furnace</p> <p>Check 24 v input to electronic control box. If you read 24 v, and above steps have been completed, replace electronic control box assembly</p> <p>Check pressure switch and tube assembly for any blockage that prevents pressure switch from operating</p> <p>Check continuity to determine if pressure switch has disengaged</p>
2 Spark shorting out to main burner	2 Realign electrode tip away from main burner but maintain spark gap to pilot burner as noted above
3. No gas at pilot burner	3 Check to see if pilot valve is opening. Look for loose or broken wiring connections. If no deficiency is found, replace valve assembly
BURNERS WILL NOT IGNITE	
1 No 115-v power to furnace	1 Connect to power supply. Check fuse, wiring or circuit breaker
2. No 24-v power to control circuit	2 Check transformer; replace
3. Miswired or loose connections	3 Check all wiring and wirenut connections
4 No gas at main burners	4 Check to see if main valve is operating. Look for loose or broken wiring connections. If no deficiency is found, replace valve assembly
5 Flame probe or connecting lead is shorted or open	5. Correct electrical shorting or open circuit
INADEQUATE HEATING	
1. Furnace undersized for application	1 Replace with proper size furnace
2 Gas input to furnace too low	2 Check gas pressure at manifold. Clock gas meter for input. If too low, increase manifold pressure, or replace with correct orifices
3 Limit switch cycles main burners	<p>3 OFF setting of fan control set too high, reset</p> <p>Dirty air filters, clean and reinstall.</p> <p>Blower speed too low, use faster speed tap</p> <p>Registers closed, restricted ductwork, open or remove restriction.</p> <p>Check heat anticipator setting on thermostat; readjust</p>
ALDEHYDE ODORS (CO), SOOTING FLAME, FLOATING FLAME	
1 Incomplete combustion — poor flame characteristics	<p>1 Air shutter on burners closed, adjust to soft, blue flame</p> <p>Check all screws around flue outlets and burner compartment; tighten</p> <p>Lack of combustion air, see Installation section</p> <p>Cracked heat exchanger, replace</p> <p>Overfired furnace; reduce input or change orifices</p> <p>Check vent for restriction; clean as required</p>



58ED,PB Horizontal Gas-Fired Furnaces
